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The Intraday Response of U.S. and U.K. Interest Rates to International Economic News

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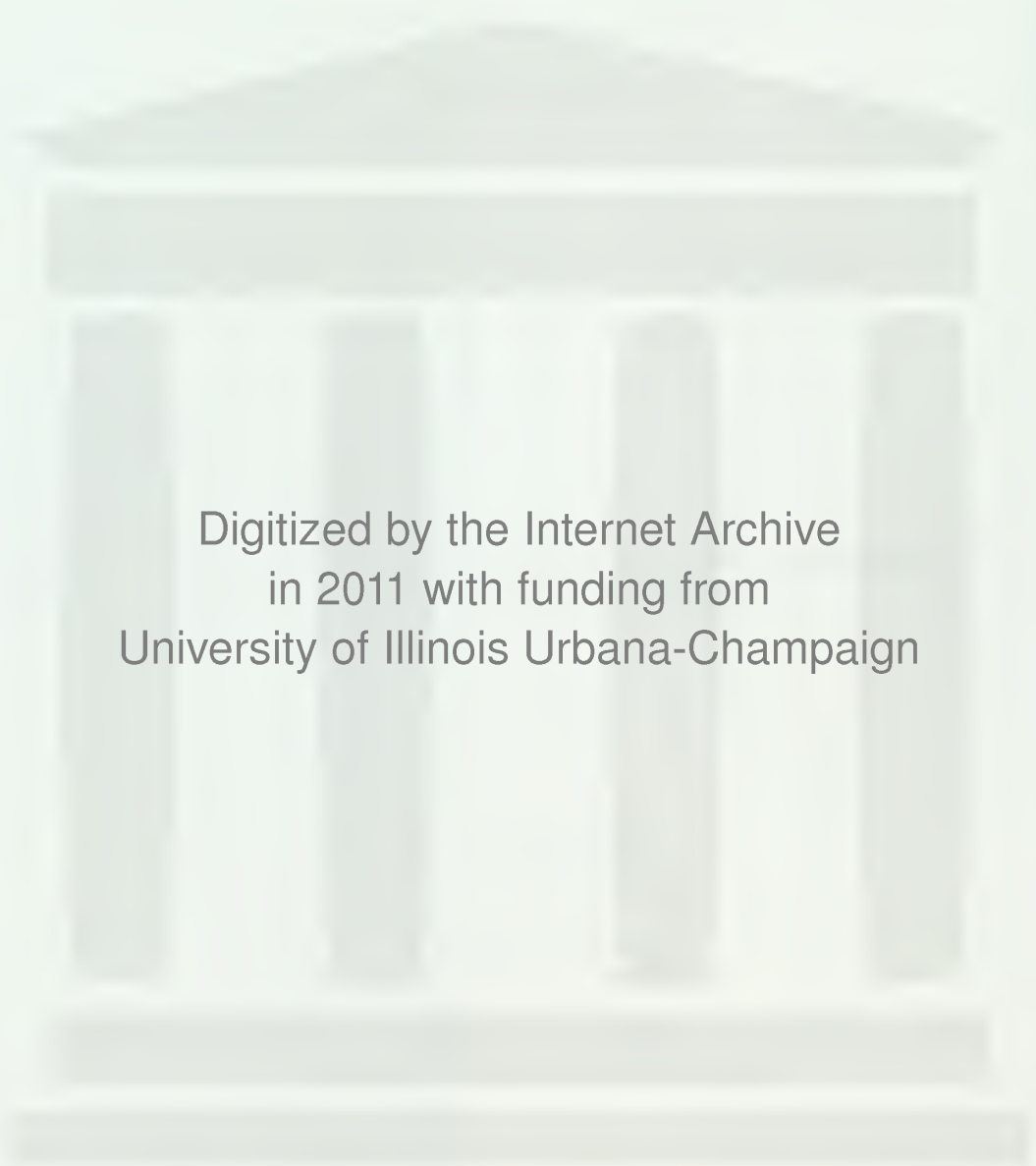
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The Intraday Response of U.S. and U.K. Interest Rates to International Economic News

This study examines the importance of U.K. and U.S. macroeconomic news on intraday price movements for bond futures contracts traded in both countries. Using macroeconomic forecast data for major announcements, we find that U.K. and U.S. participants are equally sensitive to U.S. announcements, while the U.K. macroeconomic information has an important influence on U.K. interest rates, but only a minor, although significant, influence on U.S. interest rates. The importance of U.S. news to bond markets provides insight on the causes of previously documented international asset market linkages.

The Intraday Response of U.S. and U.K. Interest Rates to International Economic News

The impact of home country macroeconomic releases on home country asset prices has received much attention in the academic literature. Jain (1988) and Pearce and Roley (1985) find that U.S. equity prices respond to U.S. macroeconomic surprises, particularly to inflation and money supply announcements. Hardouvelis (1988), Roley and Troll (1983), Smirlock (1986), and Urich and Wachtel (1984) examine the relation between U.S. announcements and U.S. interest rates. These studies generally find that U.S. interest rates are particularly sensitive to inflation and monetary announcements.¹

In the U.K., Goodhart and Smith (1985) find a significant negative association between U.K. retail price index surprises and changes in U.K. equity prices while money supply, trade balance, and government borrowing requirement surprises have no impact on U.K. equity prices. In contrast to the U.S. findings, however, Goodhart and Smith find that U.K. releases have no impact on daily changes in either long- or short-term U.K. interest rates.

While the extant research focuses on the effects of home country announcements on home country asset returns, few studies investigate the linkage between foreign country news releases and home country asset

¹The most comprehensive of these studies is by Hardouvelis (1988), who relates changes in T-Bill and T-Bond yields to 15 U.S. announcements. Using bond prices from 1979 to 1984, he finds that CPI and PPI surprises (defined as the actual announced value minus the expected value) are positively and significantly related to T-Bond yields; in contrast, these announcements have no impact on T-Bill yields. He also finds that interest rate changes are directly related to economic activity announcements as measured by unemployment and retail sales.

returns.² An examination of the relative importance of foreign information sheds light on the source of documented international asset market linkages. Previous research [see, for example Hamao, Masulis, and Ng (1990), Eun and Shim (1990), Koch and Koch (1990)] finds that the U.S. equity market is the dominant world market, as U.S. fluctuations are quickly transmitted to foreign equity markets. Eun and Shim (1990) posit that the elevated awareness of U.S. equity market performance by foreign participants is attributable to the dominance of the U.S. in the world marketplace. Accordingly, news from the U.S. will influence foreign asset prices because the U.S. is the leading producer of goods and services in the world.

In this paper, we examine the impact of U.S. and U.K. macroeconomic releases on intraday price movements for futures on U.S. Eurodollars and T-Bonds, and U.K. Gilts. Because most asset prices are influenced by the general level of interest rates, an investigation of the importance of information to the international bond markets sheds light on the sources of international asset linkages. In addition, our use of intraday bond data to examine the impact of news releases on bond prices is unique; in typical empirical investigations of the effect of macroeconomic announcements on asset prices, daily closing data are used. This practice, however, is not ideal because other information occurring during the day could obscure the effects of the news on asset prices. By using intraday bond prices (i.e., a narrower return window),

²An exception is Bailey (1990) who relates U.S. macroeconomic announcements and equity returns for Pacific Basin countries.

a more accurate estimate of the true effect of the news on the bond prices can be obtained.

We focus on macroeconomic releases to investigate the importance of general information from both countries on bond performance because these disclosures possess several attractive attributes. First, these news releases are made at predetermined dates and times. Second, the difference between the actual announced value and the expected release can be computed. Since these data are widely followed by market participants, survey forecasts of expected releases are compiled by investment services.³ Because the announcements occur at prespecified times and because expected releases are readily available, bond price changes surrounding the announcements can be related to the surprises contained in the macroeconomic releases. These government releases provide important information to bond market participants because, unlike equities where private information is an important motivator of volatility, the primary motivator of government bond price changes is publicly available information.⁴

The trading hours and structure of bond markets allow for a unique and impartial test of the importance of U.S. and U.K. information.

³Survey forecasts are compiled by Money Market Services (MMS), Technical Data, and I.D.E.A. Inc. Technical Data forecasts for the upcoming week are available in Monday editions of the Wall Street Journal and I.D.E.A. survey data are available in the New York Times Sunday business section.

⁴However, Harvey and Huang (1992) find evidence of increased return volatility in the Eurodollar and T-Bill futures market between 11:30 a.m. and 12:30 p.m. EST. This heightened volatility is attributable to private information trading by the New York Federal Reserve Bank implementing Federal Open Market Committee (FOMC) directives through open market operations.

Typically, U.K. macroeconomic announcements are circulated at 11:30 a.m. GMT while U.S. news is disclosed at 8:30 a.m. EST (1:30 p.m. GMT). Unlike stock index futures contracts on U.S. indexes, which trade only during U.S. equity trading hours, futures on Eurodollar and T-Bonds trade during U.K. trading hours. Because these instruments are active during U.K. releases, we are able to investigate the effect of U.K. releases on U.S. bond prices surrounding the announcements. In contrast, a study relating news on U.S. and U.K. intraday equity changes would be biased against a finding of significant explanatory power of U.K. news. This bias arises because the U.K. return surrounding the U.S. news can be isolated to a 15 minute period whereas the effect of U.K. news on S&P 500 performance is measured over a 17 and one-half hour period, from the previous U.S. closing price to the current opening price (9:30 a.m. EST). The U.K. information may be diluted with other information such as Japanese and U.S. macroeconomic news, resulting in both a much lower R^2 value and also insignificant estimates of the regression coefficients.

We find that U.S. news disclosures have a significant impact on both U.S. and U.K. bond futures prices, explaining approximately 20 percent of U.S. bond fluctuations in the 15 minute period surrounding the news and about 6 percent of U.K. 15 minute bond changes around the announcements. In contrast to previous research, we document a significant relation between U.K. macroeconomic news and U.K. bond prices; however, these U.K. disclosures have little impact on U.S. interest rates, particularly after the 1987 Louvre Accord. These results demonstrate the importance of U.S. information to the world

marketplace. In addition, this documented attention to U.S. news may partially explain the observed international equity market correlation structure.

We also find that most U.S. macroeconomic releases have a significant impact on T-Bond and Eurodollar returns immediately surrounding the news, while some of these announcements are not significant if a longer holding period (open-to-close) is used to measure bond performance. The lack of significance for some of the variables when the bond performance is measured from the opening to the closing price is attributable to a higher standard error for the estimated coefficient as other news occurring during the trading day obscures the true effect of the news on bond prices.

The remainder of this paper is organized as follows. Section I describes the data and methodology used in this study. In Section II, the effect of U.S. news on U.S. and U.K. bond prices is explored while Section III provides evidence of the impact of U.K. news on bond prices. Section IV examines the impact of macroeconomic releases on short-term trading activity. Section V concludes the paper.

I. Data

Fixed-income performance in the U.K. and U.S. is measured using prices from bond futures contracts traded in both countries. Price quotes closest to the quarter hour of every trading day from January 2, 1986 to December 28, 1990 are obtained from Tick Data Inc.⁵ for the U.K.

⁵The majority of the database constructed by Tick Data Inc., consisting of intraday prices for all futures contracts traded in the U.S. and London, has been compiled from official exchange time and sales records.

Long Gilt bond futures, traded on the London International Financial Futures Exchange (LIFFE), the U.S. T-Bond futures and the Eurodollar futures contracts. T-Bond and Eurodollar futures contracts are traded at the LIFFE during U.K. trading hours; during U.S. trading hours, the T-Bond futures are available at the Chicago Board of Trade (CBOT) and the Eurodollar contracts trade at the Chicago Mercantile Exchange (CME). Eurodollar contracts serve as a proxy for short-term U.S. interest rates while the T-Bonds and Gilts represent long-term rates in the U.S. and U.K., respectively.

U.K. Gilts are long-term negotiable bonds issued and guaranteed by the British Government and denominated in sterling. The U.K. gilt market accounts for the largest part of the sterling-denominated debt market and is the fifth largest government bond market in the world.⁶

The LIFFE and CME Eurodollar contracts are very similar. The trading unit consists of Eurodollar time deposits with a principal value of \$1 million and a three month maturity. Eurodollar contracts expire in March, June, September, and December, and delivery is made by cash settlement. The only major difference between the two contracts occurs on the settlement date as the two exchanges utilize different survey methods to obtain the final settlement price.⁷

⁶A Gilt primary dealer market was established in November 1986 that is similar to the U.S. T-bond market. As of June 1991, there were 18 Gilt-Edged Market Makers (GEMM's) including major U.K., U.S., Japanese, and European securities firms.

⁷See Harvey and Huang (1992) for more detail on the differences between LIFFE and CME Eurodollar contracts.

Trading hours for the LIFFE Eurodollars and T-Bonds are from 8:30 a.m. to 4:15 p.m. GMT,⁸ while trading hours for the CME Eurodollars and CBOT T-Bonds are from 8:20 a.m. to 4:00 p.m. EST.⁹ Thus, Gilt and U.S. bond futures trading span regular U.S. macroeconomic announcements, which are typically released at 8:30 a.m. EST. U.K. macroeconomic announcements are typically circulated during the U.K. trading day, at 11:30 a.m. GMT.

To measure bond performance, local currency logarithmic returns are calculated: $\ln(p_t/p_{t-1})$, where p_t is the current bond futures prices and p_{t-1} is the lagged price. Prices are obtained for the near delivery contract up to two trading days before a delivery month, when prices for the next maturing contract are used. The crash week of October 17-23, 1987 is deleted from the sample.¹⁰

U.S. and U.K. anticipated announcements are obtained from Money Market Services (MMS). The MMS data have been used extensively in studies examining the effect of announcements on asset prices [see, for example Jain (1988), Pearce and Roley (1985), and Hardouvelis (1988)]. The studies generally find that survey data, although biased, provide

⁸From 4:25 p.m. to 5:55 p.m., contracts are traded using the Automated Pit Trading (APT) system. APT is a computer trading system developed by the LIFFE which emulates the open outcry market.

⁹However, before November 8, 1988, CBOT T-Bond futures trading commenced at 9:00 a.m. EST.

¹⁰Harvey and Huang (1992) examine price movements of Eurodollar futures contracts surrounding the 1987 market crash. They report that, because of market intervention by the Federal Reserve, the Eurodollar near maturity futures price increased from 90.40 to 92.40 from October 19 to October 20, 1987.

announcement forecasts that are superior to estimates derived from an autoregressive time series model.

U.S. actual and forecast announcements are obtained from MMS for the following series: civilian unemployment rate, consumer price index (CPI), durable goods orders, housing starts, index of leading indicators, merchandise trade balance, nonfarm payrolls, producer price index (PPI), and retail sales. Announcements for the above series occur at 8:30 a.m. EST. U.S. money supply announcements are not included in the sample because they are released after U.S. trading hours, at 4:15 p.m. EST on Thursdays.

The following U.K. anticipated announcement data are obtained from MMS: current account, industrial production, M0, PPI output, public sector borrowing requirement (PSBR), retail price index (RPI), retail sales, unemployment, and visible trade.¹¹ These releases occur at 11:30 a.m. GMT. Table I provides summary statistics for the U.K. and U.S. surprises, where a surprise is defined as the actual announced value minus the expected value.¹²

¹¹The PSBR measures the borrowing requirement of the U.K. government. M0 comprises notes and coins in circulation outside the Bank of England plus bankers' operational balances with the Bank. Unlike the U.S., where money supply figures are circulated weekly, U.K. monetary aggregate announcements occur monthly. See the Monthly Digest of Statistics for information on U.K. announcements.

¹²Actual U.K. announced values are not available from MMS and are obtained from the following U.K. publications: Monthly Digest of Statistics, Economic Trends, and Financial Statistics.

II. Effects of U.S. Information on Bond Returns

A. Effects of U.S. Information on 15 Minute Bond Returns

To evaluate the impact of 8:30 a.m. EST U.S. announcements (1:30 p.m. GMT) on the Gilts, Eurodollars, and T-Bond futures returns, we estimate a regression equation, where the independent variables are the surprises and the dependent variable is the asset returns from 8:30 to 8:45 a.m. EST. On trading days in which no announcement occurs for a specific variable, the value of the surprise is assigned a value of zero. Before November 1987, CBOT T-bond futures opened at 9:00 a.m. EST; thus, for this period, the T-Bond return is measured from the previous closing price to the current opening price.

Table II presents estimated coefficients for OLS regressions relating bond futures returns surrounding the announcements to U.S. surprises. The Gilt returns are sensitive to U.S. surprises, with three out of the nine U.S. surprise variables significant at the 1 percent level (CPI, PPI, and nonfarm payrolls) and two significant at the 5 percent level (unemployment and leading indicators). In addition, the U.S. disclosures explain approximately 6 percent of the Gilt changes surrounding the announcements. The estimated coefficients indicate that the Gilts are especially sensitive to inflation disclosures as a positive 0.3 percent CPI (PPI) surprise tends to lead to a decline in Gilt prices of 0.12 percent (0.07 percent). Surprises indicating strength in the U.S. economy also lead to significant declines in Gilt prices as U.S. nonfarm payrolls and leading economic indicators have a negative sign and the unemployment rate possesses a positive sign.

The regression results presented in Table II also demonstrate the importance of U.S. information to participants in the Eurodollar and T-Bond futures markets; for Eurodollars and T-Bonds, five out of the nine coefficients are significant at least at the 5 percent level while an additional two coefficients are significant at the 10 percent level for the T-Bonds. Similar to the Gilts, both the Eurodollar and T-bond markets respond negatively to inflation surprises, while higher than expected economic activity leads to lower bond prices.

The regression coefficients indicate that a positive 0.3 percent CPI surprise leads to declines of approximately 0.47 percent and 0.06 percent for the T-Bonds and Eurodollars, respectively. A PPI surprise has a significant but somewhat smaller impact on these markets. Our finding that U.S. inflation surprises influence bond prices is consistent with Hardouvelis (1988), Roley and Troll (1983), Smirlock (1986) and Ulrich and Wachtel (1984). Because these studies use T-Bill and T-Bond interest rate changes rather than bond price returns as the dependent variable, direct comparisons with the parameter values found in our study are difficult; however, a common result is the importance of U.S. inflation surprises to the U.S. bond markets.¹³

¹³Smirlock, using interest rate data for Treasury securities from 1979 to 1983 with maturities of 10, 20, and 30 years, finds that a 1 percent CPI (PPI) surprise leads to a change of 10, 9, and 9, basis points (10, 13, 10 basis points) for the 10, 20, and 30 year bond rates, respectively. Ulrich and Wachtel report that PPI surprises are significantly related to short-term interest rates while CPI announcements are not. They find that a 1 percent PPI surprise leads to a 38 basis point increase in short-term rates. Hardouvelis, using T-Bill and 20 year T-Bond interest rates from 1979 to 1984, reports that a 1 percent PPI (CPI) surprise results in a 16 basis points (18 basis points) increase in 20 year T-Bond yields. In contrast to Ulrich and Wachtel, he finds that T-Bill yields do not respond to inflation news.

The finding of a significant relation between U.S. merchandise trade announcements and U.S. interest rates is also consistent with the results of Aggarwal and Schirm (1992). Using daily closing prices for T-Bill and T-Bond futures prices, they find that U.S. financial markets have become particularly sensitive to international macroeconomic announcements, especially since formal agreements for international economic coordination have been implemented. For example, they find that, from 1987 to 1988, after the Louvre Accord, T-Bond futures prices were particularly sensitive to trade announcements (parameter value of 0.40, compared to our value of 0.1116).

Nonfarm payrolls are of particular interest to bond market participants as a surprise expansion of the U.S. workforce by 100,000 people leads to a T-Bond decline of 0.29 percent and reductions in Eurodollars and Gilts by 0.05 percent.

The nine surprises account for approximately 23 percent of the Eurodollar fluctuations surrounding the announcements and 12 percent of the T-Bond fluctuations. Hardouvelis (1988), using daily closing interest rate data, reports much lower R^2 values (7.6 percent for T-Bill yields and 5.6 percent for T-Bond yields). The higher explanatory power of the U.S. surprises in our study may be attributable to the more refined 15 minute data used to explore the influence of the news. Moreover, in this study, the higher R^2 value for the Eurodollar regression relative to the T-Bond regression arises because the dependent variable for the T-Bond return is an overnight return from the beginning of the time series to November 7, 1988. After T-Bond trading hours were extended, the T-Bond performance is measured by the 8:30 to

8:45 a.m. EST return. Thus, the lower R^2 value for the T-Bond regression is due to the noise created by including overnight returns in measuring T-Bond performance for the first sub-period, January 1986 to November 7, 1988.¹⁴

B. Effects of U.S. Information on Open-to-Close Bond Returns

Table III presents regressions in which the bond performance for the Gilts, Eurodollars, and T-bonds is measured over a longer period, from the opening to the closing price. T-values and significance levels generally decline compared with results obtained with the narrower return window. For example, five out of the nine U.S. information variables are significant at the 5 percent level when Eurodollar performance is measured for the 15 minute period surrounding the news (Table II), while only three variables are significant when bond returns are measured from open to close. Specifically, the unemployment rate and the merchandise trade balance become insignificant when the longer return window is used. Consistent with previous research, the R^2 value for the Eurodollar and T-Bond regressions are below 10 percent. While U.S. news has a significant impact on the 11:30 to 11:45 a.m. GMT Gilt returns (as shown in Table II), results from Table III show that the U.S. announcements do not have a significant impact on the Gilt open-to-close returns; only one U.S. variable (unemployment) is significant at the 5 percent level and the R^2 for the regression is only 0.15 percent.

¹⁴The impact of U.S. surprises on T-Bond returns from 8:30 to 8:45 a.m. EST after the extension of the T-Bond trading hours has been estimated (results not reported). Parameter values and significance levels for this regression are similar to the findings presented in Table II. However, the R^2 for the T-Bond regression after the extension of trading hours is much higher, 33.24%.

A closer inspection of Tables II and III is warranted because of their strikingly dissimilar inferences regarding the importance of U.S. news on international bond prices. Inspection of the two tables reveals that parameter values are quite similar. For example, the CPI coefficient in the 15 minute Gilt regression is equal to -0.40 while this coefficient increases in absolute value to -0.60 in the open-to-close regression. However, the CPI variable is not significant in the open-to-close regression despite the larger absolute size of the coefficient, while the coefficient is significant at the 1 percent level when Gilt performance is measured directly surrounding the announcement.

The reduced significance levels for the second set of regressions in Table III is attributable to the additional information and noise that becomes available over an entire trading day. Since the open-to-close return can be viewed as the sum of the intervening 15 minute returns, all of which are independently distributed variables, the variance of the open-to-close return is larger than the variance of the 15 minute return. In this situation, estimating the coefficient of a surprise variable, which appears only in the 15 minute return surrounding the announcement, within the context of the open-to-close regression leads to unbiased but inefficient OLS estimates. In other words, open-to-close regressions are biased against finding coefficient significance even though the variable (U.S. news) has presumably been fully reflected in the 15 minute return surrounding the announcement. Table III, therefore, is less useful than Table II when used to draw inferences about the importance of U.S. news on international bond returns.

III. Effects of U.K. Information on Bond Returns

A. Effects of U.K. Information on 15 Minute Bond Returns

To measure the effect of U.K. announcements on bond prices, three regressions are estimated using 11:30 to 11:45 a.m. GMT returns for the Gilts, Eurodollars, and T-Bonds from bond futures contracts traded at the LIFFE as the dependent variables and U.K. surprises as the independent variables.¹⁵

Table IV presents estimated coefficients for regressions relating U.K. disclosures and bond futures returns. Table IV demonstrates that U.K. information influences U.K. bond returns, while U.K. news has a small influence on U.S. bond prices. The announcements explain more than 18 percent of the fluctuations in the Gilt returns surrounding the announcements (11:30 to 11:45 a.m. GMT). The Gilts are sensitive to U.K. foreign trade, government borrowing, and retail sales disclosures. As Table IV indicates, a visible trade (current account) surprise of £1 billion (trade deficit lower than expected) leads to an increase in Gilt prices of roughly 0.57 percent (0.124 percent). Higher than expected government borrowing (measured by the PSBR) of £1 billion leads to a significant decline in Gilt prices of 0.0528 percent. In addition, stronger than expected economic activity, measured by retail sales, leads to significantly depressed Gilt prices. Surprisingly, Gilt price changes are not significantly related to U.K. inflation surprises as neither the PPI output nor the RPI are significant at the 10 percent

¹⁵The time of U.K. money supply releases changed from 2:30 p.m. to 11:30 a.m. GMT in October 1986. In November 1986, the timing of the PSBR disclosures also changed to 11:30 a.m. GMT. A surprise value of zero is assigned for the M0 and PSBR releases before the change to 11:30 a.m. GMT releases.

level. The coefficient for M0 disclosures, while negative, is also insignificant.

In contrast, the U.K. news appears to have little impact on U.S. bond prices. In the T-Bond regression, only the U.K. unemployment variable is significant at the 5 percent level, while the current account is the only significant variable in the Eurodollar regression.

B. Effects of Louvre Accord on Bond Reactions

Over the sample period (1986-1990), an important change in international cooperation at the governmental level occurred. Specifically, at the Louvre meeting in 1987, France, Germany, Japan, the U.K., and the U.S. agreed to a policy shift aimed at stabilizing exchange rates. Since international cooperation may have an effect on the relation between foreign news and U.S. bond returns, we estimated the impact of the Louvre Accord by including interaction terms defined as the product of the Louvre dummy variable (=1 in the post-Accord period, 0 before) and each of the surprise variables.

The results are reported in Table V for the T-Bonds and Gilts. (Eurodollar regression results are not reported. None of the interaction variables are significant at the 10 percent level.) Regarding the real activity variables, the table indicates that the U.K. unemployment rate and retail sales had a significantly negative effect (at the 5 percent level) on U.S. bond returns in the pre-Accord period. To determine the effect of these variables in the post-Accord period, we need to add the pre-Accord coefficient estimate and the interaction term's estimated coefficient. For the unemployment rate, the interaction term is insignificant. Thus, the post-Accord estimate is

identical to the pre-Accord estimate. For retail sales, the interaction term is significantly positive at the 1 percent level, and opposite in sign, but equal in absolute value to the pre-Accord coefficient. Thus, the post-Accord estimate for retail sales is zero. The findings in Table V are consistent with those in Table IV. The coefficient estimates in Table IV are a weighted sum of the pre- and post-Accord coefficients. U.K. retail sales are insignificant in Table IV because the post-Accord coefficient is zero, whereas the unemployment rate is significantly negative in this table because the pre- and post-Accord coefficients are statistically identical.

Regarding the U.K. RPI, Table V shows a pattern similar to that for U.K. retail sales; the coefficient is significantly negative at the 10 percent level in the pre-Accord period, but because the interaction term is also significantly positive at the 10 percent level and opposite in value to the pre-Accord coefficient, the post-Accord coefficient is not significantly different from zero. Table V shows, therefore, that the Louvre Accord altered the influence of U.K. news on U.S. bond prices. Prior to the Accord, U.K. retail sales and RPI had an impact on U.S. interest rates. In the post-Accord environment, these two variables became irrelevant for the pricing of U.S. bonds.

A comparison of the Gilt and T-Bond interaction regressions (Table V) can offer a partial explanation of how the Louvre Accord altered the effect of U.K. news on the U.S. and U.K. interest rates. Prior to the Accord, the U.K. retail sales surprises influenced U.S. T-Bonds but not U.K. Gilts, which suggests that the exchange rate system effectively induced U.S. long-term rates to respond to an assortment of

world-wide real activity shocks. After the Accord, U.S. T-Bonds are statistically insulated from U.K. retail sales surprises, and the shock falls entirely on the U.K. Gilts. In addition, inflation as measured by U.K. RPI surprises does not seem to have any effect on U.K. Gilts even after the Accord when U.S. T-Bonds are no longer affected by this surprise. Apparently, the adjustment to RPI surprises has been reflected solely in the exchange rate during the post-Accord period.

C. Effects of U.K. Information on Open-to-Close Bond Returns

Our results, showing that U.K. surprises influence Gilt prices, differ from the findings of Goodhart and Smith (1985). Using daily closing U.K. three-month interbank rates and 20 year Gilt prices from 1977 to 1983, they find that U.K. short- and long-term bond prices are not responsive to U.K. surprises for M3, RPI, central government borrowing requirement, and the visible trade balance.¹⁶ Again, our results demonstrating the importance of U.K. news for U.K. bond prices may be attributable to the use of more refined intraday bond data. To support this claim, Table VI presents regression results which relate U.K. surprises on open-to-close Gilt returns. Consistent with Goodhart and Smith, the U.K. news does not have a strong influence on the Gilts, with a 1.90 percent R^2 value. The only significant variable is the visible trade surprise.

Comparison of the adjusted R^2 values from the Gilt regressions presented in Tables II and IV reveals that U.K. information is more

¹⁶In contrast to other studies, Goodhart and Smith do not utilize expectations data from MMS, but rather use forecast data from a brokerage firm.

important to the Gilt market than U.S. news. U.K. surprises explain approximately 18 percent of the changes in the 15 minute returns, while the R^2 in the U.S. news regression is approximately 6 percent.

In addition to the R^2 values, an examination of intraday Gilt return volatility patterns (see Becker, Finnerty, and Kopecky (1992)) indicates the importance of regularly scheduled macroeconomic releases to the Gilt market. Volatility spikes occur at 11:30 a.m. and 1:30 p.m. GMT, with standard deviations of returns equal to 0.157 percent for the 11:30 to 11:45 a.m. GMT returns and a standard deviation of 0.107 percent for the 15 minute returns surrounding U.S. announcements. Gilt volatility at 11:30 a.m. GMT is generally five times greater than the variances for the surrounding 15 minute periods, while the Gilt return variance at 1:30 p.m. GMT is approximately two times greater than the variances for periods leading up to the U.S. announcements. To further support the apparent lack of attention by U.S. bond traders to U.K. news, Harvey and Huang (1992) document low 11:30 a.m. GMT volatility for Eurodollar and T-Bill futures contracts traded at the LIFFE.

IV. Effects of Economic Releases on Trading Activity

The impact of surprises in both countries on bond trading activity is also investigated. Previous research documents a positive relation between price changes and volume and this empirical regularity is likely attributable to the flow of information.¹⁷ When information arrives that is substantially different from expected, a divergence of opinion

¹⁷See Karpov (1987) for a review of studies dealing with the relation between price movements and volume.

between traders will occur, leading to increased volume. Thus, a direct relation between the news content of a release of macroeconomic information and volume is expected. However, Jain (1988) finds that U.S. releases have no impact on U.S. equity volume as measured by the S&P 500. A possible explanation for this result is that most U.S. announcements occur before the equity market is open, at 9:30 a.m. EST, giving traders an extended period to evaluate the consequences of the announcements.

To analyze the relation between the surprises and trading activity, regressions are estimated of the absolute value of the surprises on the total number of trades in the 15 minute interval surrounding the announcement.¹⁸ Regression results presented in Table VII show a positive relation between U.S. surprises and Gilt and Eurodollar activity surrounding U.S. announcements.¹⁹ The absolute value of the surprises explain approximately 26 percent of the Gilt and Eurodollar number of trades from 8:30 to 8:45 a.m. EST. Most of the independent variables are significant at the 1 percent level with the exception of the housing starts release.

Table VIII shows the influence of U.K. surprises on trading activity. Most U.K. announcements are significantly related to the

¹⁸The first order autocorrelation coefficient for the number of trades series is positive and significant. Thus, the trading activity regressions are corrected for the first order autocorrelation by differencing the number of trades in the current period and the lagged number of trades times the first order autocorrelation coefficient: $\#TRADES_t - (\#TRADES_{t-1} * p)$.

¹⁹An analysis of T-Bond trading activity was not examined because CME T-Bond future trading did not span U.S. announcements for much of the series (January 1986 to November 8, 1988).

number of Gilt trades surrounding the announcements. U.K. disclosures, however, have a small influence on LIFFE Eurodollar and T-Bond activity, with only U.K. RPI releases significant at the 1 percent level.

V. Conclusion

Previous research concentrates on the influence of home country macroeconomic releases on home country assets. These studies generally find that asset prices respond to regularly scheduled government releases. This study investigates the relative importance of U.S. and U.K. macroeconomic announcements on bond markets in both countries to examine the source of international asset market linkages.

We find that bond futures returns in both countries respond to domestic news. While our finding that U.S. news influences U.S. bond prices is not novel, our finding of a significant Gilt reaction to U.K. news is unique. The U.S. news explains approximately 20 percent of Eurodollar returns surrounding the announcements and nearly 7 percent of the open-to-close returns. Similarly, the U.K. announcements explain 20 percent of Gilt 11:30 to 11:45 a.m. GMT returns and approximately 2 percent of the open-to-close returns. This significant reaction of U.K. bonds to U.K. news could be attributable to the use of a narrower holding period (11:30 to 11:45 a.m. GMT) to measure bond performance. Using this narrower return window, we find that most home country announcements have a significant impact on home country bond returns. Previous research generally finds that only inflation and money supply news move bond prices.

The Gilts respond to U.S. macroeconomic news while U.S. bond prices generally ignore U.K. information. The U.S. news explains

approximately 6 percent of the Gilt returns surrounding the news and less than 1 percent of the open-to-close returns while the U.K. announcements have a marginal influence on U.S. bonds. When investigated in more detail with a dummy variable technique, the latter finding seems to have arisen after the 1987 Louvre Accord. Nonetheless, our procedure is an impartial test of the importance of news from both countries because, unlike equities, U.S. bond futures are actively traded when U.K. news is circulated.

In addition, we find that U.S. announcements influence trading activity as measured by the number of trades in the 15 minute period after the announcements. While U.K. disclosures motivate Gilt activity, these announcements have a small impact on the number of Eurodollar and T-Bond ratings at the LIFFE; only absolute deviations in the U.K. RPI seem to influence the trading activity of U.S. instruments.

Based on the empirical results in this paper, one can infer that other news originating from the U.S., such as company specific news, public pronouncements by government officials, and news and rumors regarding Federal Reserve activities, influence U.K. interest rates. In contrast, our findings demonstrate that U.S. market participants maintain a more provincial perspective and remain focused on domestic events. The importance of U.S. news may explain previously documented equity asset market linkages. This body of research generally finds that the U.S. is the dominant market, with U.S. returns leading foreign returns by one day. These common worldwide movements may be attributable to common reactions to U.S. public information. For example, if U.S. inflation is higher than expected, U.S. bond and equity

prices will decline. Similarly, foreign asset prices will respond alike to the U.S. prices, resulting in a correlation structure in which U.S. returns lead foreign returns.

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Table I

Summary Statistics for U.S. and U.K. Surprises

Panel A: U.S. Announcement	Units	Mean Surprise	High Surprise	Low Surprise
CPI	%Δ from previous month	0.008%	0.30%	-0.20%
Durable Goods	%Δ from previous month	0.248%	6.80%	-7.50%
Housing Starts	Million units	-0.033	0.24	-1.55
Leading Ind.	%Δ from previous month	0.000%	0.80%	-0.90%
Merchandise Tr.	\$ Billion	-0.313	3.10	-6.30
Nonfarm Payrolls	Δ in thousands from previous month	18.66	331	-306
PPI	%Δ from previous month	-0.064%	0.60%	-1.10%
Retail Sales	%Δ from previous month	-0.026%	1.90%	-1.80%
Unemployment	% workforce	-0.067	0.60%	-0.40%
Panel B: U.K. Announcement	Units	Mean Surprise	High Surprise	Low Surprise
Current Acct.	£ Billion	-0.144	0.94	-1.83
Ind. Prod	%Δ from previous month	-0.174%	2.21%	-2.77%
M0	%Δ from previous month	-0.059%	0.52%	-1.35%
PPI Output	%Δ from previous month	0.025%	0.37%	-0.57%
PSBR	Δ from previous month	-0.387	0.37	-2.55
Retail Sales	%Δ from previous month	0.068%	3.05%	-1.32%
RPI	%Δ from previous month	0.052%	0.70%	-0.96%
Unemployment	Δ unemployed in thousands	-6.147	32.20	-59.30
Visible Trade	Billion	-0.096	0.79	-1.15

Table II

Effect of U.S. Surprises on Intraday Gilt, Eurodollar,
and T-Bond Futures Returns

OLS coefficient estimates and t-values (in parenthesis, absolute value) measuring the effect of U.S. macroeconomic surprises on alternative bond returns from 1986 to 1990. Independent variables are U.S. surprises, defined as the actual 8:30 a.m. EST announced figure minus the expected value. The dependent variable for the first regression is the U.K. Gilt logarithmic return from 8:30 to 8:45 a.m. EST (1:30 to 1:45 p.m. GMT). For the second regression, the dependent variable is the Eurodollar futures return from 8:30 to 8:45 a.m. EST. For the T-Bond regression, the dependent variable is the previous CBOT close to the 9 a.m. EST opening price from January 2, 1986 to November 8, 1988 and the return is measured for the 15 minute period surrounding the 8:30 a.m. EST announcement from November 8, 1988 to December 1990.

	GILT _{8:30-8:45}	EURO _{8:30-8:45}	TBOND _{8:30-8:45}
INTERCEPT	-0.0024 (0.82)	0.0000** (1.79)	-0.0105 (0.94)
CPI	-0.4026*** (3.48)	-0.2054*** (5.80)	-1.5717*** (3.94)
PPI	-0.2335*** (5.58)	-0.1341*** (10.26)	-1.1512*** (7.62)
UNEMPL	0.1753*** (2.33)	0.0732*** (3.07)	0.4556* (1.66)
LEADING IND.	-0.1024** (2.43)	-0.0118 (0.85)	-0.2515 (1.56)
DURABLE GOODS	-0.0021 (0.53)	-0.0021 (1.62)	-0.0518*** (3.38)
MER. TRADE BAL.	-0.0047 (0.67)	0.0055** (2.40)	0.1116*** (4.13)
NON-FARM PAYR.	-0.0005*** (4.94)	-0.0005*** (13.17)	-0.0029*** (7.16)
RETAIL SALES	-0.0300 (1.56)	-0.0091 (1.46)	-0.1319* (1.87)
HOUSING STARTS	0.0297 (0.52)	-0.0081 (0.43)	-0.0884 (0.42)
F VALUE	9.85***	40.63***	19.03***
R ²	6.11%	23.30%	12.29%

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Table III

Effect of U.S. Surprises on Open-to Close Gilt, Eurodollar,
and T-Bond Futures Returns

OLS coefficient estimates and t-values (in parenthesis, absolute value) measuring the effect of U.S. macroeconomic surprises on alternative bond returns from 1986 to 1990. Independent variables are U.S. surprises, defined as the actual 8:30 a.m. EST announced figure minus the expected value. The dependent variables are the open-to-close Gilt, Eurodollar, and T-Bond returns. T-Bond data are from November 8, 1988 (the date that T-Bond trading expanded to span 8:30 a.m. EST announcements) to December 31, 1990.

	GILT _{o-c}	EURO _{o-c}	TBOND _{o-c}
INTERCEPT	-0.0016 (1.03)	-0.0012 (0.50)	0.0205 (0.94)
CPI	-0.6000 (0.99)	-0.1764** (2.08)	-1.3463* (1.88)
PPI	-0.3307 (1.50)	-0.1023*** (3.18)	-0.3849 (1.32)
UNEMPL	0.8023** (2.03)	0.0892 (1.56)	2.1605*** (2.73)
LEADING IND.	-0.1947 (0.88)	-0.0159 (0.48)	0.5495* (1.64)
DURABLE GOODS	-0.0112 (0.53)	-0.0029 (0.93)	-0.0251 (0.86)
MER. TRADE BAL.	-0.0231 (0.63)	0.0013 (0.23)	-0.8046 (1.05)
NON-FARM PAYR.	-0.0005 (0.93)	-0.0006*** (8.13)	-0.0042*** (5.00)
RETAIL SALES	-0.0446 (0.44)	-0.0192 (1.28)	-0.3383* (1.91)
HOUSING STARTS	0.0146 (0.05)	-0.0015 (0.03)	0.3310 (0.48)
F VALUE	1.21	10.80***	6.00***
R ²	0.15%	6.98%	7.87%

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Table IV

Effect of U.K. Surprises on Intraday Gilt, Eurodollar,
and T-Bond Futures Returns

OLS coefficient estimates and t-values (in parenthesis, absolute value) measuring the effect of U.K. macroeconomic surprises on bond returns from 1986 to 1990. Independent variables are U.K. surprises, defined as the actual 1130 a.m. GMT announced figure minus the expected value. The dependent variables for the regressions are the 11:30 to 11:45 a.m. GMT logarithmic returns for the LIFFE Gilts, Eurodollars, and T-Bonds, respectively.

	GILT _{11:30-11:45}	EURO _{11:30-11:45}	TBOND _{11:30-11:45}
INTERCEPT	-0.0129 (3.16)	-0.0001 (0.73)	-0.0017 (1.27)
CURRENT ACC.	0.1242** (2.02)	0.0066** (2.01)	0.0034 (0.17)
VISIBLE TRADE	0.5722*** (7.62)	-0.0039 (0.96)	0.0283 (1.16)
IND. PROD.	-0.0033 (0.18)	0.0013 (1.33)	0.0019 (0.31)
MO	-0.0993 (1.47)	-0.0013 (0.36)	0.0335 (1.53)
PPI-OUTPUT	0.0153 (0.13)	-0.0011 (0.18)	-0.0180 (0.47)
RPI	-0.1106 (1.49)	0.0006 (0.16)	0.0054 (0.22)
PSBR	-0.0528*** (2.61)	0.0006 (0.58)	-0.0016 (0.24)
RETAIL SALES	-0.0726*** (5.03)	-0.0009 (1.19)	0.0003 (0.07)
UNEMPLOYMENT	0.0000 (0.01)	0.0006 (1.04)	-0.0074** (2.02)
F VALUE	30.80***	1.10	0.53
ADJUSTED R ²	18.60%	0.08%	0.00%

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Table V

Effect of the 1987 Louvre Accord on LIFFE Gilt and T-Bond Returns

OLS coefficient estimates and t-values (in parenthesis, absolute value) measuring the effect of U.K. macroeconomic surprises on bond returns from 1986 to 1990. Independent variables are U.K. surprises, defined as the actual 11:30 a.m. GMT announced figure minus the expected value and the interaction terms defined as the product of the Louvre dummy variable (=1 in the post-Accord period and 0 before) and each of the surprise variables. The dependent variables for the regressions are the 11:30 to 11:45 a.m. GMT logarithmic returns for the LIFFE Gilts, and T-Bonds, respectively.

	GILT _{11:30-11:45}	TBOND _{11:30-11:45}
INTERCEPT	-0.0135*** (3.36)	-0.0011 (0.37)
CURRENT ACC.	0.2421 (1.52)	0.0116 (0.23)
VISIBLE TRADE	0.0577 (0.34)	0.0605 (1.11)
IND. PROD.	-0.0437 (1.00)	0.0040 (0.28)
MO	0.0641 (0.36)	0.0731 (1.26)
PPI-OUTPUT	-0.0223 (0.06)	-0.1484 (1.14)
RPI	-0.1820 (0.55)	-0.1974* (1.80)
PSBR	-0.1514* (1.87)	0.0311 (1.16)
RETAIL SALES	-0.0300 (1.08)	-0.0211** (2.31)
UNEMPLOYMENT	-0.0046 (0.17)	-0.0019** (2.15)
DUM87*CURRENT ACCOUNT	0.1525 (0.89)	-0.0161 (0.29)
DUM87*VISIBLE TRADE	0.6656*** (3.49)	-0.0468 (0.76)

Table V (continued)

DUM87*INDUSTRIAL PROD.	0.0493 (1.03)	-0.0027 (0.17)
DUM87*MO	-0.1901 (0.99)	-0.0503 (0.80)
DUM87*PPI-OUTPUT	0.0281 (0.07)	0.1494 (1.10)
DUM87*RPI	0.0776 (0.23)	0.2147* (1.91)
DUM87*PSBR	0.1038 (1.24)	-0.0341 (1.24)
DUM87*RETAIL SALES	-0.0557* (1.72)	0.0288*** (2.71)
DUM87*UNEMPLOYMENT	0.0577 (0.20)	0.0014 (1.45)
F VALUE	17.13***	1.30
ADJUSTED R ²	19.11%	0.53%

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Table VI

Effect of U.K. Surprises on Open-to Close Futures Returns

OLS coefficient estimates and t-values (in parenthesis, absolute value) measuring the effect of U.K. macroeconomic surprises on bond returns from 1986 to 1990. Independent variables are U.K. surprises, defined as the actual 11:30 a.m. GMT announced figure minus the expected value. The dependent variables are the LIFFE Gilt, Eurodollar, and T-Bond returns. The dependent variables are the LIFFE, Gilt, Eurodollar, and T-Bond open-to-close returns.

	GILT _{0-c}	EURO _{0-c}	TBOND _{0-c}
INTERCEPT	-0.0121 (0.73)	0.0045 (0.32)	-0.0612 (0.99)
CURRENT ACC.	0.2951 (1.25)	0.0051 (0.02)	-0.0145 (0.01)
VISIBLE TRADE	0.5855** (2.04)	0.1021 (0.39)	-0.0056 (0.01)
IND. PROD.	0.0917 (1.30)	0.0251 (0.36)	-0.0145 (0.06)
MO	-0.0534 (0.21)	-0.1025 (0.43)	0.0061 (0.01)
PPI-OUTPUT	0.2322 (0.52)	-0.0251 (0.06)	0.0788 (0.04)
RPI	-0.2713 (0.95)	-0.0831 (0.31)	0.0487 (0.04)
PSBR	-0.0825 (1.07)	0.0430 (0.61)	-0.0193 (0.06)
RETAIL SALES	-0.0584 (1.06)	-0.0199 (0.40)	-0.0006 (0.00)
UNEMPLOYMENT	0.0013 (0.30)	0.0017 (0.42)	-0.0012 (0.07)
F VALUE	3.63***	0.17	0.00
ADJUSTED R ²	1.90%	0.00	0.00

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Table VII

Effect of U.S. Surprises on the Number of Trades

OLS coefficient estimates and t-values (in parenthesis, absolute value) measuring the effect of U.S. macroeconomic surprises on the number of trades per 15 minute period from 1986 to 1990. Independent variables are the absolute value of U.S. surprises, defined as the actual 8:30 a.m. EST announced figure minus the expected value. The dependent variables are the number of trades for the LIFFE Gilt and the CME Eurodollar near maturity contract from 8:30 to 8:45 a.m. EST.

	GILT*TRADES	TBOND#TRADES
INTERCEPT	13.69*** (24.59)	10.18*** (21.86)
CPI	116.20*** (6.13)	98.72*** (6.17)
PPI	66.85*** (9.19)	55.12*** (9.05)
UNEMPL	34.52** (2.18)	62.87*** (4.78)
LEADING IND.	15.68** (2.15)	18.13*** (2.94)
DURABLE GOODS	3.99*** (5.72)	3.67*** (6.21)
MER. TRADE BAL.	12.67*** (10.41)	8.54*** (8.28)
NON-FARM PAYR.	0.18*** (7.68)	0.16*** (8.52)
RETAIL SALES	23.22*** (6.92)	17.33*** (6.09)
HOUSING STARTS	18.86* (1.91)	6.49 (0.39)
F VALUE	49.02***	54.32***
R ²	26.06%	27.61%
DW	2.01	2.07

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Table VIII

Effect of U.K. Surprises on the Number of Trades

OLS coefficient estimates and t-values (in parenthesis, absolute value) measuring the effect of U.K. macroeconomic surprises on the number of trades per 15 minute period from 1986 to 1990. Independent variables are the absolute value of U.K. surprises, defined as the actual 1130 a.m. GMT announced figure minus the expected value. The dependent variables are the number of trades for the LIFFE Gilt, Eurodollar, and T-Bond near maturity contract from 11:30 to 11:45 a.m. GMT.

	GILT#TRADES	EURO#TRADES	TBOND#TRADES
INTERCEPT	15.97*** (24.57)	2.67*** (28.54)	3.74*** (23.49)
CURRENT ACC.	12.78 (1.08)	-0.29 (0.17)	-1.54 (0.53)
VISIBLE TRADE	71.98*** (4.98)	0.62 (0.30)	3.65 (1.03)
IND. PROD.	10.12*** (3.61)	-0.56 (1.38)	0.48 (0.68)
MO	48.45*** (4.77)	-2.44* (1.67)	-0.23 (0.09)
PPI-OUTPUT	65.74*** (3.53)	-2.77 (1.03)	-6.41 (1.41)
RPI	70.60*** (6.29)	6.60*** (4.09)	8.93*** (3.25)
PSBR	20.30*** (6.69)	0.20 (0.46)	-1.01 (1.35)
RETAIL SALES	12.36*** (5.40)	0.22 (0.68)	0.59 (1.05)
UNEMPLOYMENT	0.83*** (4.85)	0.04* (1.78)	-0.02 (0.40)
F VALUE	40.70***	2.56***	1.95***
ADJUSTED R ²	22.54%	1.13%	0.69%
DW	2.04	2.03	2.07

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

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